

## AMENDMENTS TO CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

### Listing of Claims:

1. (Currently Amended) A method for increasing an effective communications channel bandwidth beyond that of a constrained physical bandwidth, and thereby increasing a spectral efficiency and a data rate of a channel, and/or a power efficiency of the channel, by orthogonal signal spectrum overlay (OSSO) comprising the steps of:

decomposing a time-bandwidth product (TBP) of a given symbol in a data stream transmitted by a transmitter through a given physical bandwidth; and

non-linearly expanding said TBP in terms of an orthogonally overlaid signal basis set constituting eigensignals of said symbol such that the eigensignals resulting from decomposition and non-linear expansion of said TBP of said symbol are overlaid in both time and frequency domains and occupy a same physical space, wherein the number of orthogonal signals obtained in a specific symbol is set by the size of the TBP of the symbol.

2. (Canceled)

3. (Original) ~~The method defined in claim 1~~ for increasing an effective communications channel bandwidth beyond that of a constrained physical bandwidth, and thereby increasing a spectral efficiency and a data rate of a channel, and/or a power efficiency of the channel, by orthogonal signal spectrum overlay (OSSO) comprising the steps of:

decomposing a time-bandwidth product (TBP) of a given symbol in a data stream transmitted by a transmitter through a given physical bandwidth; and

non-linearly expanding said TBP in terms of an orthogonally overlaid signal basis set constituting eigensignals of said symbol such that the eigensignals resulting from decomposition

Serial Number 10/765,990

and non-linear expansion of said TBP of said symbol are overlaid in both time and frequency domains and occupy a same physical space, wherein the orthogonally overlaid signal basis set are Weber-Hermite (WH) functions and the number of WH signals obtained in a specific symbol is set by the size of the TBP of the symbol.

4. (Original) The method defined in claim 1 wherein the complete data stream is multiplexed to produce a plurality of data channels, each of which is encoded on orthogonal signals.

5. (Currently Amended) The method defined in claim ~~2~~1 wherein OSSO symbols and associated orthogonal signals are transmitted in quadrature format (I and Q) and is the result of the addition of orthogonal signals, each of which constitutes a separate but overlaid communication channel, all occupying the same physical bandwidth.

6. (Currently Amended) A system for increasing an effective communications channel bandwidth beyond that of a constrained physical bandwidth, and thereby increasing a spectral efficiency and a data rate of a channel, by orthogonal signal spectrum overlay (OSSO) comprising: means for decomposing the time-bandwidth product (TBP) of a symbol in a data stream transmitted through given bandwidth, and means for non-linearly expanding said TBP in terms of an orthogonally overlaid signal basis set that constitute eigensignals of said symbol within a set channel such that the eigensignals resulting from decomposition and non-linear expansion of said TBP of said symbol are overlaid in both time and frequency domains and occupy a same physical space, wherein the orthogonally overlaid signal basis set are Weber-Hermite (WH) functions and the number of WH signals obtained in a specific symbol is set by the size of the TBP of the symbol.

7. (Canceled)

8. (Original) The system ~~defined in claim 6 including~~ for increasing an effective communications channel bandwidth beyond that of a constrained physical bandwidth, and thereby increasing a spectral efficiency and a data rate of a channel, by orthogonal signal spectrum overlay (OSSO)

comprising: means for decomposing the time-bandwidth product (TBP) of a symbol in a data stream transmitted through given bandwidth, means for non-linearly expanding said TBP in terms of an orthogonally overlaid signal basis set that constitute eigensignals of said symbol within a set channel such that the eigensignals resulting from decomposition and non-linear expansion of said TBP of said symbol are overlaid in both time and frequency domains and occupy a same physical space, and means to multiplex in the complete data stream to produce a plurality of data channels, each of which is encoded on WH signals.

9. (Original) The system defined in claim 8 wherein OSSO symbols and associated WH signals are transmitted in quadrature format (I and Q) and is the result of the addition of WH signals, each of which constitutes a separate overlaid communication channel, all occupying the same physical bandwidth.

10. (Currently Amended) A transmitter for expanding a time bandwidth product (TBP in terms of an overlaid basis set of signals constituting eigensignals of an orthogonal signal spectrum overlay (OSSO) symbol, comprising means for converting a data word into subwords assigned in parallel to individual orthogonal signals, means for encoding the data for each subword by quadrature amplitude modulation (QAM) of each separate orthogonal signal such that the QAM-modulated signals are then overlaid in quadrature format (I and Q) to form a non-linear symbol modulation and the symbol modulation in I and Q is used as the envelope to a ~~to~~ chosen carrier forming the OSSO symbol; digital-to-analog (D-A) means for analog-to-digital conversion of said OSSO symbols and means for transmitting said OSSO symbol on a carrier to a point of utilization.

11. (Currently Amended) A point of utilization receiver wherein an OSSO symbol is received from ~~the a transmitter defined in claim 10~~ and the carrier removed, said transmitter including means for converting a data word into subwords assigned in parallel to individual orthogonal signals, means for encoding the data for each subword by quadrature amplitude modulation (QAM) of each separate orthogonal signal such that the QAM-modulated signals are then

overlaid in quadrature format (I and Q) to form a non-linear symbol modulation and the symbol modulation in I and Q is used as the envelope to a chosen carrier forming the OSSO symbol; digital-to-analog (D-A) means for analog-to-digital conversion of said OSSO symbols and means for transmitting said OSSO symbol on a carrier to a point of utilization.

wherein said receiver comprises~~comprising~~: analog-to-digital (A-D) converter means for analog-to-digital conversion of the symbol envelope in I and Q forms, template means for correlating or matching the orthogonal signals against the symbol envelope in both I and Q, permitting the recovery of the QAM constellations associated with each orthogonal signal so that the data for each subword is then recovered from each of the constellations and the symbol data word is recovered by parallel to serial conversion of the signal subwords.

12. (New) The method defined in claim 3 wherein the complete data stream is multiplexed to produce a plurality of data channels, each of which is encoded on orthogonal signals.